EXHIBIT 12B

61 percent) of the 77 drugs were priced more than twice as high in the United States as in the United Kingdom. (See fig. I.2.)

Figure I.1: Range of U.S.-U.K. Drug Price Differentials

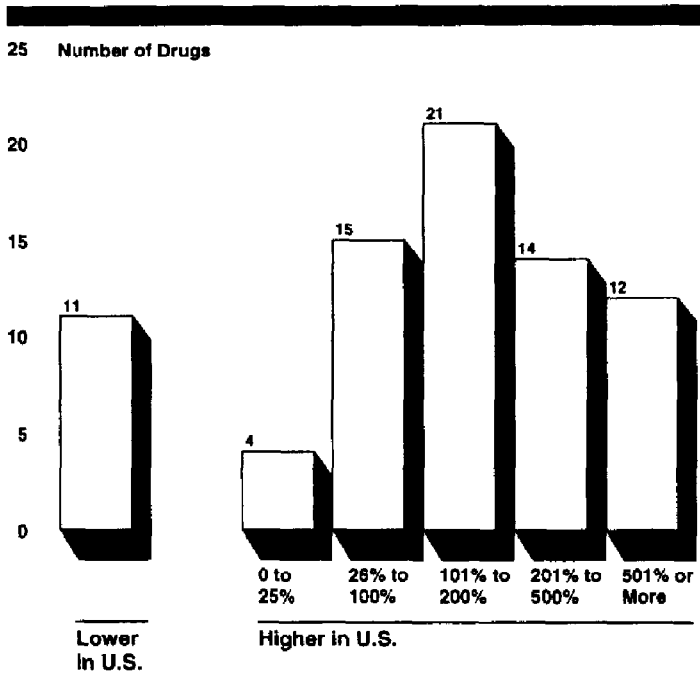
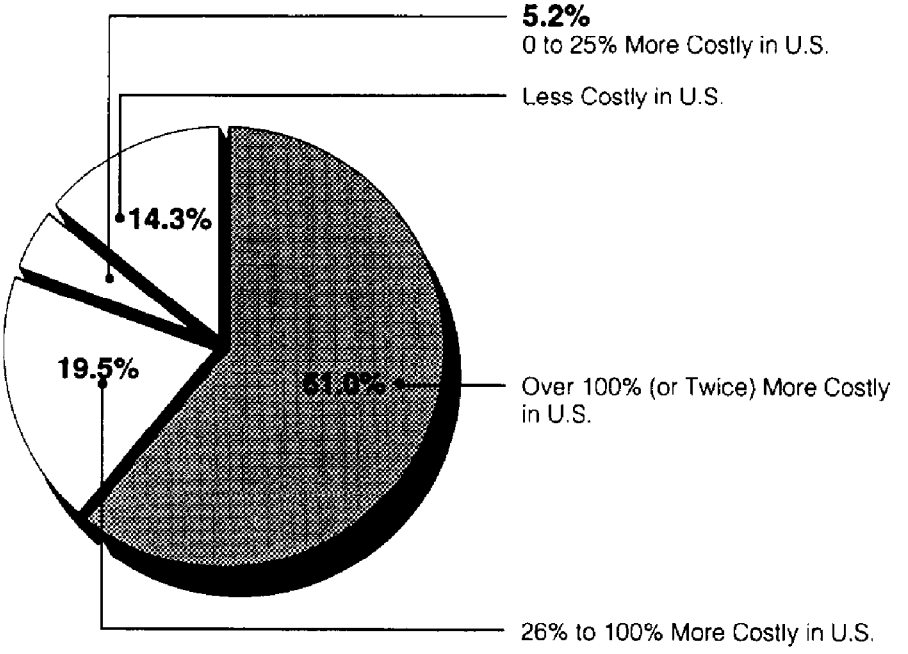


Figure I.2: Many Drugs Have Factory Prices Over Twice as High in the United States as in the United Kingdom



The five most commonly dispensed drugs in the United States in 1991 illustrate U.S.-U.K. differentials in factory prices. Amoxil, the most commonly dispensed drug, cost 40 percent less in the United States than in the United Kingdom. However, Premarin, Zantac, Lanoxin, and Xanax—the second, third, fourth, and fifth most commonly dispensed drugs in the United States, respectively—cost 197, 58, 169, and 278 percent more in the United States than in the United Kingdom. (See table I.1.)

Table I.1: The Five Most Commonly Dispensed Drugs Illustrate Range of U.S.-U.K. Price Differentials

Rank	Product/ unit	Manufacturer or vendor	Therapeutic category	U.S. unit price	U.K. unit price	Percent price difference[a]
1	Amoxil, 250 mg cap	Beecham	anti-infection	$0.165	$0.273	–40
2	Premarin, .625 mg tab	Wyeth-Ayerst	estrogens	0.276	0.093	197
3	Zantac, 150 mg tab	Glaxo	gastro-intestinal	1.228	0.775	58
4	Lanoxin, .25 mg tab	Burroughs Wellcome	cardio-vascular	0.063	0.023	169
5	Xanax, .5 mg tab	Upjohn	central nervous system	0.519	0.137	278

[a]Price difference calculated manually will differ due to rounding.

Price Differentials Persist After Adjusting for Manufacturers' Discounts

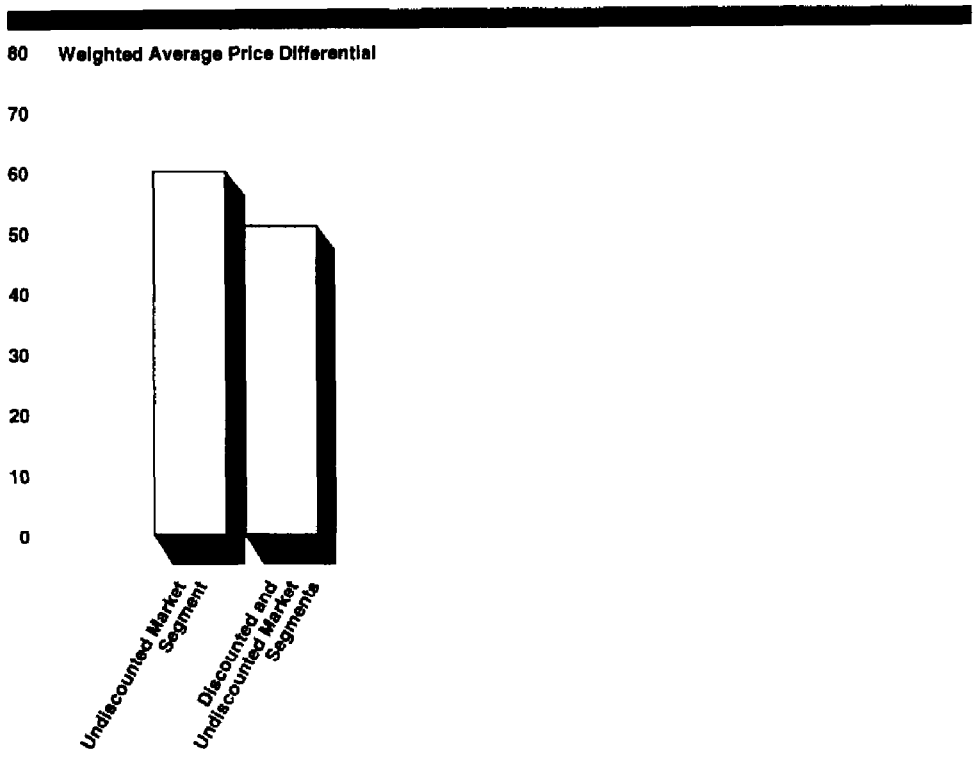
When we extended our analysis beyond the undiscounted market segment to include other U.S. market segments in which certain buyers (such as mail order pharmacies and some HMOs) receive price discounts, we still found U.S.-U.K. drug price differentials that were substantial. (See fig. I.3.) In particular, for the market basket in our study, manufacturers would receive (on average, from all market segments) 51 percent more in the United States than in the United Kingdom.[23] (Recall that, by contrast, for the factory prices prevailing in the undiscounted market, the complete market basket of 77 drugs would cost 60 percent more in the United States.)[24,25]

[23]This market basket contains 75 drug products, not 77, because for 2 brand-name drugs in our sample, price information pertaining to the wider range of market segments was not available.

[24]When the aggregate cost of the 75 drugs was recomputed using WAC as the U.S. price, the differential was the same.

[25]The non-FAMP price data, which we obtained from the VA, are provided to VA by the drug manufacturers and are considered business proprietary data. Thus, we could not report the non-FAMP prices for individual drug products.

Figure I.3: Large U.S.-U.K. Price Differentials Persist After Accounting for Discounts in Other U.S. Market Segments



Effect of Replacing U.S. Brand-Name Prices With Generic Prices

Our focus on whether manufacturers charge higher prices in the United States than in the United Kingdom led us to make price comparisons for brand-name drugs. Generic drugs were beyond the scope of our study because they are typically manufactured and sold by different, unaffiliated firms in each country. However, the availability of lower priced generic drugs could mitigate to some extent the effect of the high prices of brand-name drugs on the typical consumer.

Although a comprehensive analysis of U.S.-U.K. price differentials for the broad array of generic drugs sold in the United States is beyond the scope of this study, we did conduct a limited analysis of the effect on differentials of including generic equivalents of the drugs in our sample. In particular, we compared what our market basket of 77 drugs would cost if U.S. consumers purchased the lowest priced generic product in the 21 cases where generic drugs were available, and if U.K. consumers always purchased the brand-name product.

We found that our particular market basket of drugs would still cost substantially more in the United States than it would in the United Kingdom, even though most of the lowest priced U.S. generic drugs cost less than their brand-name counterparts in the United Kingdom. Even under the unrealistic assumption that lower priced generic drugs were unavailable in the United Kingdom but purchased when available in the United States, the entire market basket of 77 drugs would cost 50 percent more if purchased in the United States than in the United Kingdom.[26] However, substituting the lowest generic price had a substantial impact on the price differentials of those particular drugs. Whereas 17 of the 21 brand-name prices were higher in the United States than in the United Kingdom, coincidentally, 17 of the lowest U.S. generic prices were lower than the corresponding U.K. brand-name prices.

Size of Price Differentials Associated With Several Factors

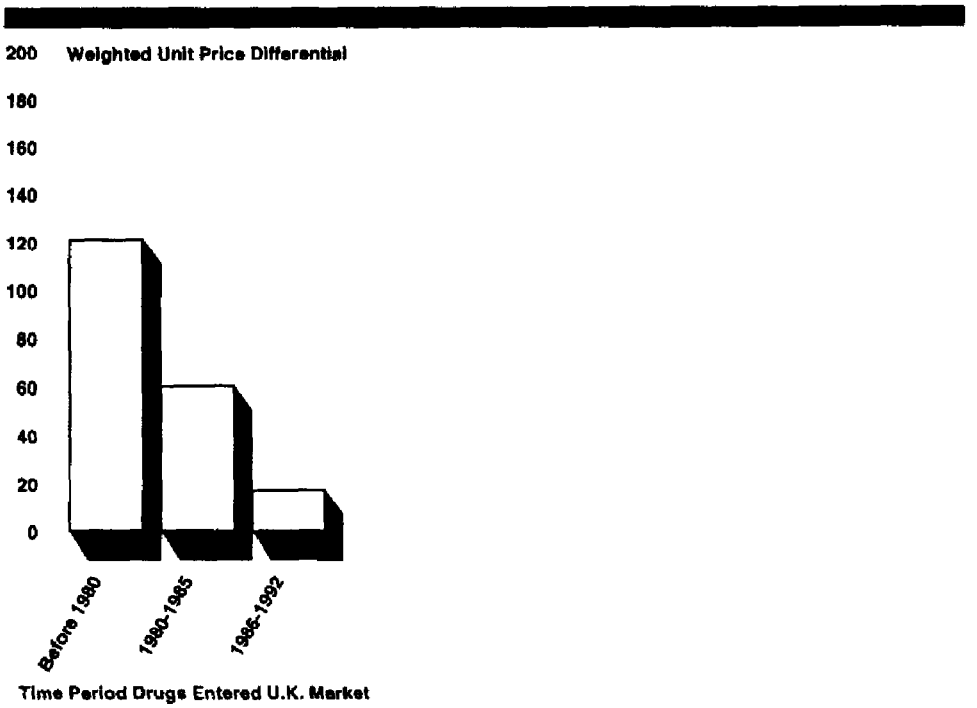
Price Differentials Tend to Be Smaller for Newer Drugs

The wide variation in price differentials for brand-name drugs is associated with several factors, such as time on the market. Price differentials tend to be smaller, in general, for brand-name drugs that entered the U.K. market relatively recently. We found that the 16 drugs in our market basket that entered the U.K. market between 1986 and 1992 cost 17 percent more in the United States than in the United Kingdom. By contrast, for the 22 drugs that entered the market between 1980 and 1985, the price differential is 59 percent; for the 39 drugs introduced before 1980, the differential is 121 percent. (See fig. I.4.)[27]

[26]In this analysis, we replaced the U.S. brand-name drugs with their least expensive generic equivalents. When measuring U.K. prices, however, we did not replace the U.K. brand-name prices with the prices of U.K. generic substitutes. This procedure minimizes any excess of U.S. prices over U.K. prices.

[27]We found similar results when we analyzed drug prices for those drugs introduced more recently in the U.S. market. In particular, we compared the U.S. and U.K. prices of 18 drugs approved for use in the United States in 1990 and 1991 and introduced to the U.S. market during 1990, 1991, and 1992 that were not among the 200 most widely dispensed drugs in the United States. We found that a weighted market basket of these drugs would cost 10 percent more in the United States than in the United Kingdom.

Figure I.4: More Recently Introduced Drugs Have Smaller U.S.-U.K. Price Differentials



There are two plausible explanations for why drug price differences tend to be smaller the less time a drug has been on the market. First, U.K. government restrictions on drug price increases could result in a situation where any excess of U.S. prices over U.K. prices would widen over time. For example, if a drug were introduced into the U.S. and U.K. markets in the same year and at the same price, a substantial U.S.-U.K. price difference would emerge and increase over time because U.K. government policies would prevent or restrain price increases while U.S. prices would most likely increase each year.

Second, according to a U.K. government official and industry experts in both countries, pharmaceutical manufacturers have recently adopted a strategy of charging similar prices for newly launched drugs in different countries. These experts and officials argue that the new pricing pattern would lead to smaller price differentials for newer drugs.

Available evidence does not allow us to evaluate the relative importance of either of these two explanations. However, it is worth noting that the two

explanations have very different implications for the future. The "new pricing strategy" explanation implies that in the future, after about a decade of new product introductions, average price differentials will be considerably smaller. The "government price restraint" explanation, however, implies that even negligible initial price differentials of new products will become much larger over time.

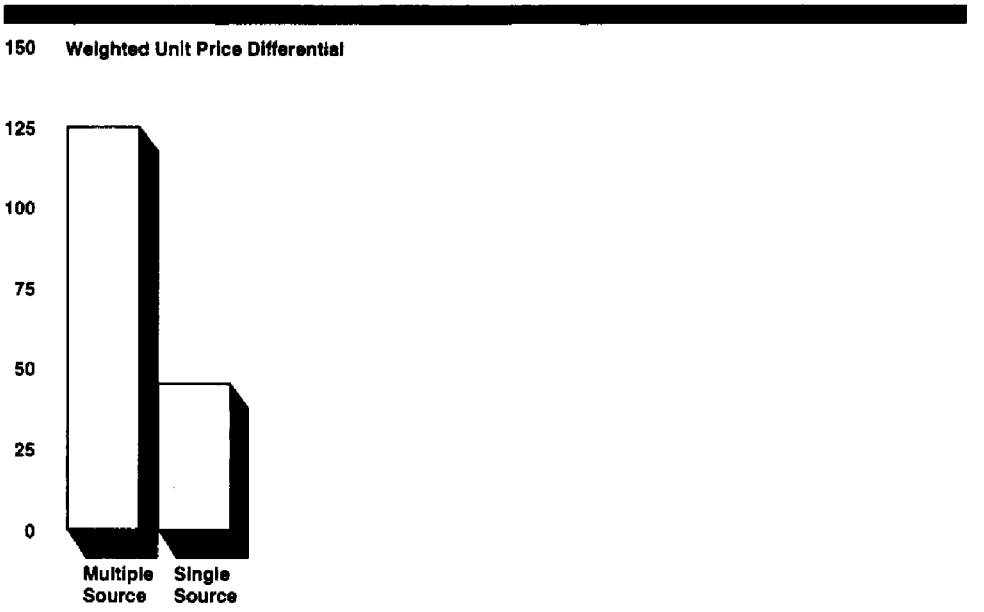
Price Differentials Tend to Be Larger for Multiple-Source Drugs

In addition to time on the market, the presence of generic substitutes for a brand-name drug is associated with variation in price differentials. We found that price differentials tended to be larger for "multiple source" drugs in our study—brand-name drugs that have (chemically identical) generic substitutes—than for those brand-name drugs that are single source—that is, they have no generic substitute. For example, for drugs that were multiple source in both countries, our market basket cost 125 percent more in the United States than in the United Kingdom, while, for single-source drugs in the U.S., the market basket was 45 percent more expensive. Because drugs with generic substitutes have usually been on the market for longer periods, this finding is consistent with our result that older drugs have wider price differentials. In addition, this pattern is consistent with findings from other studies, which suggest that in the U.S. market, manufacturers of brand-name drugs react to competition from lower priced generics in a counterintuitive manner—by increasing prices on their brand-name products.[28] Manufacturers try to differentiate their products from their rivals' based on their products' perceived quality, brand loyalty, and such "line extensions" as a sustained release form of a drug. Product differentiation creates a market niche that is likely to be less responsive to high prices than the niche of consumers who purchase (lower priced) generics.[29] (See fig. I.5.)

[28]See, for example, Health Care Financing Administration, Manufacturers' Prices and Pharmacists' Charges for Prescription Drugs Used by the Elderly, Health Care Financing Administration, (Washington, D.C.: June 1990).

[29]We also found this pattern in our comparison of U.S. and Canadian prescription drug prices. See Prescription Drugs: Companies Typically Charge More in the United States Than in Canada.

Figure I.5: Drugs With Multiple Sources in the United States and the United Kingdom Have Larger U.S.-U.K. Price Differentials



Manufacturers' Costs Are Not Major Source of Drug Price Differentials

Variations in manufacturers' costs are not the major source for international drug price differences. This conclusion applies not only to production costs but to the costs associated with marketing, distribution, and research and development. Pharmaceutical manufacturers' officials and industry experts generally cite three reasons to support this conclusion:

- First, a substantial portion of drug research and development costs is not allocated to individual drug products in specific countries. Thus, this portion of manufacturers' costs could not result in differences in the cost or price of a given drug between countries.
- Second, although some other costs (such as those associated with marketing and sales or with regulatory compliance) are allocated to individual drug products, country-by-country differences in these costs are not large—at least compared to the magnitude of the differences in prices.
- Third, the costs of production and distribution also are allocated to specific drug products but make up only a small share of the total cost of any drug. Even if these costs were to differ greatly, they would not substantially affect the total cost of a drug or its price. Consequently, production and distribution costs cannot be a major source of international price differentials.

Government Influence in the U.K. Market Restrains U.K. Drug Prices

Differences in a drug's price in the two countries are driven by factors that influence how much a manufacturer can charge for a drug in one country's market versus the other's. In the United States, manufacturers have historically been free to set drug prices based on market conditions. Moreover, the U.S. market for outpatient drugs has lacked, at least until recently, strong forces that restrain what manufacturers can charge.[30] In the United Kingdom, though, quite different market conditions prevail. The U.K. government, operating within a health system that is publicly financed and publicly run, uses its predominant position as single payer for prescription drugs to exercise concentrated buying power and to achieve lower drug prices.

Since 1969, the U.K. government has limited the overall profits of the drug manufacturers. If this profit ceiling is not breached, current regulations generally permit a manufacturer to freely set the introductory prices of newly released drugs. Subsequently, however, a drug manufacturer may increase prices only with government consent. Other government-related factors that together may lower average U.K. drug prices include the wide diffusion of information on drugs' prices and efficacy, the use of reimbursement practices that spur competition between manufacturers of innovative drugs and generics, and the importing of lower priced brand-name products from other European countries.

U.K. Government Limits Drug Manufacturers' Profits and Price Increases

To restrain prescription drug prices, the U.K. government limits drug manufacturers' profits from sales to the U.K. National Health Service. This indirect method of influencing prices has been in place for more than two decades. Since 1969, the U.K. government and pharmaceutical industry have done business under a nonstatutory, voluntary agreement known as

[30]Manufacturers in the U.S. market for outpatient drugs have historically faced little countervailing power, either from government regulation (of drug prices) or from private firms and organizations with concentrated buying power. Now, however, some industry experts believe that the U.S. market is undergoing a transformation. For example, in the 1990 Omnibus Budget and Reconciliation Act, the Congress included a provision that drug manufacturers provide rebates to state Medicaid programs based on the discounts (or "best price") offered to their best customers. In the private sector, HMOs have also begun to exercise more bargaining power and to obtain lower prices for drug products.

the Pharmaceutical Price Regulation Scheme (PPRS).[31,32] Under the PPRS, the U.K. government monitors drug manufacturers' profits, comparing each company's profits to a maximum rate of return on capital.[33] Within the range of maximum rates of return—currently 17 to 21 percent—each company with sales to the NHS exceeding £0.5 million (or about $740,000) is given its own profit ceiling.[34] If a company's profits exceed this ceiling, the company must return those excess profits to the NHS or lower the price of its product.[35]

In its pursuit of drug price restraint, the U.K. government combines an indirect method of price restraint—profit controls—with a direct method—restrictions on manufacturers' price increases. Under the PPRS, profit ceilings ensure price moderation in general without setting the price of any particular drug by government fiat. A manufacturer of a newly released drug is free to set its introductory price, provided that the company's profits do not exceed its stipulated limit. Thereafter, a manufacturer seeking a price increase must win the approval of the government. The government and the manufacturer negotiate price increases on the basis of their estimates of the revenues needed to achieve the manufacturer's negotiated profit ceiling.[36]

[31]The PPRS has evolved from a series of voluntary agreements between the U.K. government and the pharmaceutical industry. The first agreement, dating back to 1957, was actually a price regulation scheme. By 1969, the PPRS had emerged as a scheme focusing on overall firm profits rather than on individual drug prices.

[32]The PPRS is periodically negotiated between the U.K. government and the U.K. association representing the pharmaceutical industry. Until recently, the U.K. government and the pharmaceutical industry were operating under the PPRS negotiated in 1986. The pharmaceutical industry and government have reached a new agreement, which took effect on October 1, 1993. This agreement, like the 1986 agreement, covers manufacturers' brand-name products whether on or off patent. It excludes over-the-counter drug products and generic products.

[33]Profit limits for companies with insufficient capital in the United Kingdom are considered in relation to their return on sales.

[34]The control of profits is supplemented by regulations that cap the percentage of sales revenue that can be devoted to some components of cost, notably sales promotion.

[35]The U.K. government may allow manufacturers to retain additional profits earned on NHS medicines in certain circumstances, such as the launch of a new product or increased efficiencies. Under the 1986 PPRS agreement, manufacturers were allowed to retain up to an additional 50 percent of the company's profit ceiling; under the new agreement, manufacturers can retain only an additional 25 percent of the company's profit ceiling.

[36]The agreement between drug manufacturers and the U.K. government was recently renegotiated. While manufacturers are still free to set introductory prices for new products, under the new agreement prescription drug prices in the U.K. were cut by 2.5 percent. This cut will remain in effect for 3 years, beginning October 1, 1993.

Other Factors in U.K. Market May Restrain Prescription Drug Prices

We observed several other factors present in the U.K. pharmaceutical market that may help lower average U.K. brand-name drug prices by spurring greater price competition between the manufacturers of brand-name drugs and manufacturers of generic products. These factors largely reflect actions taken by the U.K. government. Although none of the following factors in isolation appears to affect drug prices substantially, together they encourage price-sensitive buying in the U.K. market and cumulatively could exert downward pressure on brand-name drug prices.

- The availability to U.K. physicians of comparative information on drug price and efficacy fosters competition. Since the late 1980s, the U.K government has undertaken two initiatives that increase physicians' awareness of drug prices and stiffen physicians' incentives to prescribe cost-effective medication. In 1988, the U.K. government introduced the Prescribing Analyses and Cost System to provide each physician with information on the volume and cost of the medications he or she prescribed. In addition, each physician receives comparable data on the average prescribing practices of physicians in general. To supplement this system, in 1991 the U.K. government established the Indicative Prescribing Scheme (IPS), with the aim of reducing drug outlays and improving the appropriate prescription of drugs. Under the IPS, physicians are given a prescribing benchmark (known as an indicative amount of prescribing), which is used in evaluating the overall cost of their prescribing. In addition, the U.K. government established a variety of physician educational programs to improve the cost effectiveness and quality of physicians' prescribing practices.[37]

  By requiring that U.K. physicians select drugs on the basis of price as well as efficacy, the government increases downward pressure on U.K. drug prices. U.K. physicians must consider a drug's price reasonable, or its manufacturer risks losing business to manufacturers of less expensive drug products. In general, the more price sensitive physicians are, the greater the incentive for manufacturers to price drugs more moderately.

- The U.K. government promotes the use of lower priced drugs through its reimbursement practices. Through elements of its drug reimbursement

[37]To monitor physicians' prescribing patterns, the NHS also has advisers located throughout the United Kingdom. For those physicians who, compared to the average physician, write many more prescriptions (or many more prescriptions for expensive drugs) and who, therefore, exceed their indicative amounts, NHS advisers use peer influence to persuade them to modify their prescribing behavior. If persuasion fails to produce sufficient change, the NHS can require the physician to pay back the amount by which individual prescriptions are deemed to be excessive. The ultimate sanction is termination of the physician's contract, which in effect would put the typical U.K. physician out of business.

policy, the U.K. government fosters competition between the manufacturers of innovative and generic drugs to achieve lower drug prices. For example, with its 1985 introduction of the Selected List Scheme, the government restricted the number of drugs for which it would allow reimbursement by NHS. The restrictions were applied in seven therapeutic categories: analgesics for use for mild or moderate pain, indigestion remedies, laxatives, vitamins, cold and cough remedies, tonics, and benzodiazepine tranquilizers.[38] This scheme also limited the reimbursement price for drugs that remained on the Selected List. Finally, in conjunction with the Selected List Scheme, the government established an advisory committee of medical and pharmaceutical experts; its mission is to review the price and efficacy of newly released drugs in the seven therapeutic categories.

The use of the Selected List exerts downward pressure on manufacturers' prices for drugs in the restricted categories and encourages the purchase of generic products. For a manufacturer of a drug in one of these categories to gain, or retain access to, the U.K. market, its prices must be accepted by the advisory committee. If a manufacturer refuses to sell its drug at a price the committee considers reasonable, the U.K. government can refuse to reimburse that manufacturer's product.[39]

- Parallel importing in Europe allows U.K. wholesalers and retailers to import brand-name drug products from other European countries where the identical drugs are available at lower prices. According to U.K. government officials and industry experts, some U.K. wholesalers and retailers import drugs from European countries, such as Belgium and France, where factory prices of the identical drugs may be 20 to 30 percent below the factory price in the United Kingdom. This practice—known as parallel importing—may exert downward pressure on prices of some brand-name drugs, contributing to lower average U.K. drug prices. Government officials and industry experts estimated that, during 1992, drugs available through parallel importing represented only 8 to 12 percent

[38]In the fall of 1992, the U.K. government announced plans to extend the Selected List to include drugs in 10 more therapeutic categories, including antidiarrheal drugs, drugs for allergic disorders, hypnotics and anxiolytics, appetite suppressants, drugs for vaginal and vulval conditions, contraceptives, drugs used in anemia, topical antirheumatics, drugs for the ear and nose, and drugs for the skin. This extension of the Selected List was expected to be phased in during the fall of 1993.

[39]The Selected List consists of a black list that contains nonreimbursable products (drugs not on the black list are assumed to be reimbursable). Under the Selected List Scheme, if a manufacturer's product offers little therapeutic advancement and the manufacturer refused to sell its product at a price the advisory committee deemed reasonable, the product would be placed on the black list of nonreimbursable products. However, if a manufacturer submitted a price that the advisory committee deemed reasonable, the product would be reimbursable.

of the U.K. market for drugs. However, this percentage is expected to increase.

Implications of U.K.-Style Government Regulations in U.S. Market Unclear

Although government regulation has restrained drug prices in the United Kingdom, the implications—and the desirability—of similar intervention in the U.S. pharmaceutical market are unclear. The United Kingdom's experience, like Canada's, provides an example in which government action restrains drug prices. Considerable uncertainty remains, however, as to whether the methods used in the United Kingdom to restrain drug prices would have similar results in the United States.

Industry representatives and government officials have credited the U.K.'s profit-control regulations with restraining drug prices. Notwithstanding its apparent effectiveness, however, the particular system used in the United Kingdom may not be readily transferrable to the United States because of institutional differences between the two countries. Specifically, because NHS represents virtually a single buyer for prescription drugs, it has the bargaining power to make and enforce the voluntary PPRS agreement with the industry. In the United States, where buying power is more fragmented, such an agreement would be more difficult to reach. In addition, the effects of a price reduction in the U.K. market may differ from the effects of a similar price reduction in the United States. In comparison with the United States, U.K. pharmaceutical outlays represent a relatively small share of the worldwide market. Consequently, a reduction in U.S. drug prices would depress manufacturers' revenues to a greater degree than would a similar price reduction in the United Kingdom.

In addition, the desirability of lower drug prices—beneficial to consumers and public insurance programs—must be weighed against the possible consequences of such prices for the domestic industry and for research and development. Critics of drug price regulation claim that it would reduce research and development, thereby limiting the availability of new drugs. Proponents of regulation dispute this conclusion; they see the industry's high profits and marketing expenses as cushions that could absorb price reductions. The debate over the potential effects of drug price regulation—particularly the contention that higher drug prices encourage pharmaceutical research and development—cannot be resolved solely by referring to U.K. drug prices. In any case, this larger issue is beyond the scope of this study.

Differences in Manufacturers' U.S. and U.K. Prescription Drug Prices (May 1, 1992)

Rank[a]	Product	Manufacturer or vendor
181	Achromycin V	Lederle
1	Amoxil	Beecham
65	Anaprox[c]	Syntex
94	Ativan	Wyeth-Ayerst
96	Atrovent	Boehringer Ingelheim
125	Axid	Lilly
133	Bactroban	Beecham
93	Buspar	Mead Johnson
16	Capoten	Squibb
152	Catapres	Boehringer Ingelheim
7	Ceclor	Lilly
63	Ceftin	Allen & Hanburys
25	Cipro	Miles
142	Cleocin T	Upjohn
185	Clinoril	MSD[g]
163	Compazine[d]	SKF[h]
90	Corgard	Bristol Labs
135	Dolobid	MSD[g]
53	Duricef	Mead Johnson
14	Dyazide[d]	SKF[h]
171	Elavil	Stuart
104	Eryc	Parke-Davis
141	Erythrocin Staerate	Abbott
58	Estraderm	Ciba
45	Feldene	Pfizer
47	Glucotrol	Roerig
50	Hismanal[e]	Janssen
98	Hytrin	Abbott
41	Inderal	Wyeth-Ayerst
106	Isoptin	Knoll
159	Keflex	Dista
101	Klonopin	Roche
4	Lanoxin	Burroughs Wellcome
32	Lasix	Hoechst-Roussel
168	Loestrin 21[f]	Parke-Davis
42	Lopid	Parke-Davis

Appendix II
Differences in Manufacturers' U.S. and U.K. Prescription Drug Prices (May 1, 1992)

Therapeutic category	Strength	Form	U.K. Unit price	U.S. Unit price	Percent difference[b]
tetracyclines	250 mg	capsule	0.077	0.029	-62.29
penicillins	250 mg	capsule	0.273	0.165	-39.73
non-steroidal anti-inflammatory	275 mg	tablet	0.227	0.561	147.23
benzodiazepines	1 mg	tablet	0.041	0.516	1,154.26
anticholinergic	18/20 mcg	inhaler	0.658	1.391	111.45
misc. gastro-intestinal	300 mg	capsule	1.510	2.143	41.94
antibiotics	2%	ointment	0.425	0.712	67.47
misc. anxiolytics	5 mg	tablet	0.500	0.421	-15.85
cardiac	25 mg	tablet	0.336	0.479	42.45
hypotensive	.1 mg	tablet	0.100	0.387	285.86
cephalosporins	250 mg	capsule	0.739	1.527	106.47
cephalosporins	250 mg	tablet	1.407	2.290	62.79
quinolones	250 mg	tablet	1.172	2.033	73.38
antibiotics	1%	top.sol.	0.315	0.277	-12.02
non-steroidal anti-inflammatory	200 mg	tablet	0.338	0.847	150.75
tranquilizers	10 mg	tablet	0.058	0.610	945.34
cardiac	40 mg	tablet	0.291	0.704	141.52
non-steroidal anti-inflammatory	250 mg	tablet	0.141	0.691	390.23
cephalosporins	500 mg	capsule	0.518	2.239	331.77
diuretics	50/25 mg	capsule	0.122	0.270	122.19
antidepressants	25 mg	tablet	0.040	0.276	596.92
erythromycins	250 mg	capsule	0.326	0.289	-11.34
erythromycins	250 mg	tablet	0.174	0.110	-36.88
estrogens	50 mcg	patch	1.456	1.583	8.72
non-steroidal anti-inflammatory	20 mg	capsule	0.495	1.830	269.48
sulfonyloreas	5 mg	tablet	0.092	0.252	173.81
antihistamines	10 mg	tablet	0.297	1.327	346.73
hypotensive	2 mg	tablet	0.718	0.830	15.58
cardiac	40 mg	tablet	0.038	0.374	871.62
cardiac	80 mg	tablet	0.147	0.349	138.24
cephalosporins	250 mg	capsule	0.199	0.977	390.29
benzodiazepines	2 mg	tablet	0.144	0.759	427.52
cardiac	.25 mg	tablet	0.023	0.063	168.70
diuretics	40 mg	tablet	0.068	0.145	112.12
contreceptives	1.5 mg/ 30 mcg	tablet	0.094	0.844	800.25
antilipemic	600 mg	tablet	0.780	0.754	-3.43

(continued)

Rank[a]	Product	Manufacturer or vendor
23	Lopressor	Geigy
74	Lotrisone	Schering
71	Macrodantin	Norwich-Eaton
192	Medrol	Upjohn
179	Minocin[d]	Lederle
69	Motrin	Upjohn
13	Naprosyn	Syntex
198	Nizoral	Janssen
131	Nolvadex	ICI[f]
122	Nordette	Wyeth-Ayerst
150	Noroxin	MSD[g]
107	Orudis	Wyeth-Ayerst
54	Pepcid	MSD[g]
140	Persantine	Boehringer Ingelheim
184	Premarin Vaginal	Wyeth-Ayerst
2	Premarin	Wyeth-Ayerst
200	Propine	Allergan
26	Provera	Upjohn
18	Prozac	Dista
191	Questran	Bristol Labs
100	Retin-A	Ortho
146	Rogaine	Upjohn
124	Sinemet	Dupont
118	Suprax	Lederle
19	Tagamet	SKF[h]
80	Tegretol	Geigy
164	Tenoretic	ICI[f]
12	Tenormin	ICI[f]
60	Timoptic	MSD[g]
173	Tobrex	Alcon
77	Trental	Hoechst-Roussel
155	Tri-Norinyl	Syntex
37	Triphasil	Wyeth-Ayerst
57	Valium	Roche
10	Vasotec	MSD[g]
114	Ventolin Syrup	Allen & Hanburys
34	Voltaren	Geigy
5	Xanax	Upjohn

Appendix II
Differences in Manufacturers' U.S. and U.K. Prescription Drug Prices (May 1, 1992)

Therapeutic category	Strength	Form	U.K. Unit price	U.S. Unit price	Percent difference[b]
hypotensive	50 mg	tablet	0.091	0.384	321.79
antifungals	1-.05%	cream	0.364	0.797	119.25
urinary anti-infect.	100 mg	capsule	0.273	0.891	226.67
adrenals	16 mg	tablet	0.746	0.951	27.48
tetracyclines	100 mg	capsule	1.028	1.821	77.07
non-steroidal anti-inflammatory	400 mg	tablet	0.081	0.149	84.26
non-steroidal anti-inflammatory	375 mg	tablet	0.293	0.724	146.90
antifungal	2%	cream	0.199	0.541	172.70
antineoplastic	10 mg	tablet	0.323	1.106	242.43
contraceptives	.15/0.03 mg	tablet	0.046	0.836	1,712.00
urinary anti-infect.	400 mg	tablet	0.750	1.827	143.45
non-steroidal anti-inflammatory	50 mg	capsule	0.113	0.759	574.08
misc. gastro-intestinal	20 mg	tablet	0.782	1.080	38.18
vasodilating	25 mg	tablet	0.059	0.229	288.95
estrogens	.625 mg/gm	cream	0.081	0.528	555.55
estrogens	.625 mg	tablet	0.093	0.276	196.59
mydriatics	.1%	ophth.	0.764	1.940	153.82
progestins	5 mg	tablet	0.201	0.394	95.61
antidepressants	20 mg	capsule	1.670	1.608	-3.69
antilipemic	4 gm	powder	0.653	0.956	46.38
cell stimulants	.05%	cream	0.157	0.811	416.34
misc. skin & mucous	2%	top.sol.	0.521	0.744	42.76
unclassified therap.	25/100 mg	tablet	0.197	0.494	151.23
cephalosporins	200 mg	tablet	2.141	2.047	-4.38
misc. gastro-intestinal	400 mg	tablet	0.536	1.034	93.05
misc. anticonvulsants	200 mg	tablet	0.093	0.262	181.24
cardiac	100-25 mg	tablet	0.465	1.071	130.17
cardiac	100 mg	tablet	0.390	1.002	157.21
misc. eyes, ears, nose, and throat	.5%	ophth.	1.819	2.510	37.96
antibiotics	.3%	ophth.	0.447	2.480	454.77
hemorrheologic	400 mg	tablet	0.299	0.370	23.64
contraceptives	var.	tablet	0.083	0.740	788.25
contraceptives		tablet	0.082	0.767	836.39
benzodiazepines	5 mg	tablet	0.039	0.446	1,031.28
cardiac	10 mg	tablet	0.616	0.696	13.14
sympathomimetic	2 mg/5 ml	syrup	0.007	0.051	583.70
non-steroidal anti-inflammatory	50 mg	tablet	0.285	0.696	143.97
benzodiazepines	.5 mg	tablet	0.137	0.519	278.18

(continued)

Rank[a]	Product	Manufacturer or vendor
3	Zantac	Glaxo
52	Zestril	Stuart
68	Zovirax capsules[d]	Burroughs Wellcome

Therapeutic category	Strength	Form	U.K. Unit price	U.S. Unit price	Percent difference[b]
misc. gastro-intestinal	150 mg	tablet	0.775	1.228	58.44
cardiac	10 mg	tablet	0.677	0.612	-9.58
antivirals	200 mg	capsule	1.806	0.691	-61.74

[a]Product's rank among American Druggist's 200 most commonly dispensed drugs in the United States in 1991.

[b]Percent differentials calculated manually may differ due to rounding.

[c]Anaprox DS (double strength) is listed on the "Top 200 list." However, we compared the lower strength Anaprox (275 mg tablet) to its U.K. equivalent because the larger strength was not sold by the manufacturer in the United Kingdom.

[d]This drug was sold in capsules in one country and in tablets in the other.

[e]The May 1, 1992, WAC was not listed in Medi-Span MDDB-Select and was obtained directly from the manufacturer.

[f]Loestrin FE (with iron) is listed on the "Top 200 list." However, we compared the equivalent drug without the iron supplement because the version with iron is not sold in the United Kingdom.

[g]Merck Sharp and Dohme.

[h]Smith Kline and French Labs.

[i]Imperial Chemical Industries.

Methodological Issues for International Prescription Drug Price Comparisons

Previous research has found that prescription drug prices are generally higher in the United States than in other countries. However, these studies have been criticized for methodological shortcomings, leading some to discount their conclusions. Although drug price comparisons seem straightforward at first glance, undertaking such a comparison requires a number of complex methodological decisions. For example, two chemically identical drug products may be manufactured by the same company in the United States and United Kingdom but nonetheless may differ in other respects—package size, strength, or form—making comparisons problematic.

Methodological controversies in drug price comparisons center around three basic questions:

- What price concept is being measured?
- For what sample of drugs are these prices measured?
- How are the results of this price comparison summarized and presented?

To conduct a price comparison, researchers must take a position on each of these questions. Our answers to each question, and our reasons for adopting these positions, cannot be properly understood without considering the purpose of this study. As our price comparison illustrates, in comparing drug prices, purpose appropriately influences method.

Purpose of the Study Affects Price Concept Measured

The Chairman's request for international drug price comparisons led us to compare the manufacturer's component of the prices paid by the typical retail consumer in the outpatient market in the United States and in the United Kingdom. Our study focuses on the factory component of the prices prevailing in the largest segment of the prescription drug market, rather than the factory component of the average price in the entire prescription drug market.

In the United Kingdom, sales to the National Health Service dominate the prescription drug market. By contrast, the U.S. market features many buyers, and manufacturers' prices are not uniform across the U.S. prescription drug market. In the United States, manufacturers often charge higher prices to wholesalers (who supply the retail pharmacies frequented by most U.S. consumers) and may give discounts to certain institutional buyers, like some hospitals and certain health maintenance organizations. However, the undiscounted portion of the prescription drug market not only accounts for the majority of U.S. prescriptions dispensed but also

includes the most vulnerable consumers—those who pay out of pocket for prescription drugs. From a manufacturer's point of view, each price in each segment of its market is relevant to the total picture. However, from the consumer's point of view, the prices paid by buyers in other markets are irrelevant—the relevant price is the price paid in that consumer's particular submarket. Our study focuses on price differentials from the point of view of the typical consumer, and for our purposes the relevant market is the market frequented by that consumer. Rather than studying the average revenue a firm receives from sales of a particular drug, we are studying the price the firm charges for drugs in the undiscounted market.[1]

Our study focused on the manufacturer's role (as opposed to the retailer's role, for example) in determining prescription drug prices. For this reason, we measured the price that manufacturers charge to the next point of distribution—the factory price. This emphasis on the manufacturer forces another methodological choice—that is, we compared only those drugs manufactured or licensed by the same firm in each country. In practice, this same-manufacturer criterion has the effect of excluding generic drugs from our analysis, because generic drugs are typically manufactured and sold in various countries by different, unaffiliated companies.[2]

Purpose of Study Suggests Criteria for Sampling Decisions

After considering the appropriate price measure, we turned our attention to the second issue: For what sample of drugs are these prices being measured? Given our focus on the manufacturer's component of the price faced by the majority of U.S. consumers, we selected the four specific methodological criteria listed below. These criteria are not given in order of importance.

- Because we are looking at the outpatient market from the U.S. consumer's point of view, our methodology should use the U.S. consumer (rather than the U.K. consumer) as its frame of reference.
- "Apples-to-apples" comparisons are ideal; that is, we should compare the same drug, identical in all respects, in the two countries.

[1]Although prices prevailing in other market segments are peripheral to our study, comparing U.S.-U.K. prices across all market segments can provide context for our findings. To make this comparison, we used data on the non-federal average manufacturer price. The non-FAMP data represent a weighted average price to the manufacturer for a given time frame and product, taking into account cash discounts or similar price reductions to large buying groups.

[2]To explore the implications of this exclusion, we supplemented our comparison of brand-name drug prices with another analysis that accounted for generic drugs. In this analysis, when a generic equivalent was available for a U.S. brand-name drug, we substituted the lowest priced generic for the brand-name product. We did not make similar substitutions for generic drugs in the United Kingdom, so our analysis provides a measure of the maximum effect of generic substitution for the sample of brand-name drugs we examined.

- We should match as many drugs as possible in the United States and the United Kingdom in order to enhance the reliability of our results.
- In choosing among methodological options, we should seek to estimate price differentials conservatively. If we must err, we would prefer to underestimate rather than overestimate price differentials if U.S. prices are typically higher than foreign prices.[3]

These goals may conflict. For example, if we considered drugs in different package sizes or strengths to be comparable, we would gain a larger sample size, but we might have sacrificed some strict comparability.

Choice of Population and Sample of Drugs

Rather than sample from the entire population of prescription drugs, we confined our examination, first, to the 200 top-selling drugs in the United States, and, secondly, to those drugs in the group for which we could find matches in the United Kingdom. The sample of drugs in our study, therefore, was not selected randomly. We recognize that random samples are preferable for their attractive statistical properties, but the difficulties of collecting a large enough sample of randomly drawn pharmaceutical data were prohibitive.[4]

Nonrandomness, however, is not necessarily a fatal flaw for three reasons. First, the nonrandom sample may hold substantial interest. Just as the Fortune 500—a nonrandom sample of firms—are of interest, so the top 200 drugs are of interest. Second, the more dominant a sample is—the greater amount of total drug sales represented by the sample—the less the nonrandomness matters. (The top-selling 200 drugs accounted for 54.9 percent of the U.S. prescription drug market in 1991.) Nonetheless, our estimates of U.S.-U.K. drug price differences cannot be generalized beyond the sample we examined.

We faced several difficult choices in matching U.S. and U.K. drugs from our sample. Apples-to-apples comparisons are difficult when a U.S. apple

[3]In statistical terms, this criterion is equivalent to requiring a very high significance level to reject the null hypothesis that U.S. and European drug prices are not significantly different.

[4]Drugs with high sales rankings, for example, tend to be sold in more countries. A random sample of all drugs sold in the United States would include drugs with low sales, for which it would probably be difficult to find matches in the United Kingdom. The resulting sample, while randomly drawn, might be considerably smaller than a nonrandom sample of best-selling drugs.

and a U.K. apple may differ in several respects—such as package size, strength, and form.[5]

Comparing Chemically Identical Drugs When Different Strengths and Forms Are Available

Chemically identical drugs are often produced by the same manufacturer in different strengths. For example, the same drug may be available in 100 mg, 250 mg, 300 mg, or 500 mg in the United States (with 300 mg being the most common) and 150 mg, 250 mg, or 400 mg in the United Kingdom (with 150 mg being the most common). Our options in this case included comparing the most common U.S. strengths with the closest U.K. counterparts and comparing the most common strengths in each country.

Our preferred method was to see if the most common U.S. strength was offered in the United Kingdom. If so, we compared the drug in that strength; if not, we looked for a match in another strength. If none of the strengths matched, we dropped the drug from our sample. For this study, comparing drugs with different strengths was less appropriate than comparing drugs with different package sizes because the actual drug, and not just the number of pills in the box, would be different.

Similarly, drugs may be available in different forms in the United States than in the United Kingdom. Our options included matching drugs on the basis of number of kilograms of active ingredient or the average daily dose. Because medical practices in each country would influence such comparisons, we did not consider it appropriate for this study to compare drugs that differ in form. If the form of a drug differed in the two countries, we dropped it from our sample.[6]

Package Size Variation Is Problematic

Prescription drugs are sold to wholesalers in packages of pills. The packages may vary in size across countries, with the price per pill differing by package size. Most researchers make price comparisons by computing a price per pill in each country on the basis of a package size sold in that country. The problem then becomes picking the package size to serve as the basis for that calculation. We considered five alternative methods, each with advantages and disadvantages. Based on our four criteria—making an apples-to-apples comparison, increasing our sample size, using the U.S. consumer as the point of reference, and providing a

[5]In addition, some drugs may be sold by prescription only in one country and sold over the counter in another. We excluded these drugs from our analysis because the differences in prescription status could make price differentials more difficult to interpret.

[6]Drugs in identical strengths may be treated as equivalent if they are prescribed in tablet form in one country and capsule form in another.

conservative estimation procedure—we chose to base the U.S. unit price on the most common package size and to base the U.K. unit price on the closest package size (but still smaller) to that selected for the United States.

For each method we considered, an example can show how the method might work and what its advantages and disadvantages would be. For purposes of our discussion, consider the example of a brand-name drug sold in the United States in package sizes of 500, 100, and 60 (100 being the most common) and in the United Kingdom in package sizes of 50, 30, and 10 (30 being the most common). Following are the five methods we considered:

1. Drop all drugs without an equal package size. With this method, we would not include any drug that did not have an equal package size in the United States and the United Kingdom. In our example, the drug would be dropped from our study.

This method best satisfies our apples-to-apples criterion; that is, this technique achieves the strictest comparability. However, because many drugs are not sold in the same package size in the United States and the United Kingdom, this method would limit our sample size. In addition, if U.S. package sizes are uniformly larger and these larger package sizes represent volume discounting on the part of U.S. firms, then calculating prices on the basis of the smaller package size available in both countries could overstate the U.S.-U.K. price differential.

2. Choose the largest package size. With this method, a unit price would be calculated for each country on the basis of the largest package size of the drug sold in that country. In our example, this would imply that the U.K. unit price would be calculated based on a package size of 50, and the U.S. unit price would be calculated on the basis of a package size of 500.

The method allows us to maintain a larger sample size and allows for the possibility of volume discounts by U.S. firms. However, this technique fares poorly in the apples-to-apples criterion because the package size differences would be large. In addition, this criterion does not use the U.S. consumer as its point of reference in calculating the U.K. price.

3. Choose the most common package size. This method involves using the most common package size for each country. For our example, this would

mean that the U.S. unit price would be based on a package size of 100, and the U.K. unit price would be based on a package size of 30.

This method may capture potential volume discounts, and it would likely allow us to make more comparisons. However, it has two major disadvantages: it is likely to produce larger package size differences than the following two methods, and it does not use the U.S. consumer as the point of reference.

4. Choose the U.K. package size closest to the most common U.S. package size. In this two-step process, we would first base the U.S. unit price on the most common U.S. package size. The U.K. price would be based on the package size closest to, but still smaller than, the most common U.S. package size. In our example, the most common U.S. package size is 100, and so we would base the U.S. price on a package size of 100. The closest U.K. package size to the most common U.S. size, but still smaller, is 50, so the U.K. unit price would be based on a package size of 50.

This method comes closer to equalizing the package sizes than do methods 2 and 3, so it rates higher on the apples-to-apples criterion. It uses the U.S. consumer as the point of reference by making the basis for the U.K. price depend on the most common U.S. package size. It allows for a larger number of comparisons than method 1 and captures the potential for volume discounting.

5. Choose U.K. package size closest to the most common U.S. size, then choose U.S. package size closest to that. This approach is a three-step process that resembles method 4. The three steps are (1) take the most common U.S. package size; (2) find the U.K. package size closest to the most common U.S. size, but still smaller, and use that as the basis for calculating the U.K. unit price; and (3) for calculating the U.S. unit price, use the U.S. package size closest to the size used to calculate the U.K. price, but still larger. In our example, the most common U.S. package size was 100. The U.K. package size closest to that but still smaller is 50, so the U.K. unit price will be calculated on the basis of the package size of 50. The U.S. package size closest to the U.K. package size is 60, so the U.S. unit price would be computed on the basis of a package size of 60.

This method minimizes package size differences, so it ranks higher on the apples-to-apples criterion than methods 2, 3, and 4, while allowing for a larger sample size than does method 1. However, this method does not use the U.S. consumer as the primary point of reference because the U.S. unit

price is not based on the most common U.S. package size. As an additional drawback, this method has less potential than method 4 to capture volume discounting.

The appropriate choice depends on the relative values of the different criteria. If apples-to-apples had been our only consideration, then method 1 would have been the appropriate choice. If we had also been very concerned about having a large sample size, but less concerned about producing conservative estimates, then method 5 would have been most appropriate.

We decided to weigh each of the criteria equally, which induced us to choose method 4. Method 4 ranks high on the criteria of the U.S. consumer as the point of reference and a large sample size; it ranks relatively high on conservative estimation; and it is better than methods 2 and 3 on the apples-to-apples criterion.[7]

Study Focus Influenced Presentation of Results

Although most of our methodological issues revolved around defining the comparability of drugs sold in different countries, we also made choices about summarizing and presenting our results. Once again, we made these decisions with reference to the specific purpose of our study.

Converting From One Currency to Another

An unavoidable problem arises when comparing prices from different countries: to make any price comparison meaningful, prices must be converted to a common currency (from pounds to dollars, for example). This can be done in two ways—using exchange rates and using purchasing power parities. Our preferred method was to calculate the differential using both methods and report both results. Reporting both results is particularly valuable when exchange rates and PPPs yield significantly different estimates.

Exchange Rates Versus PPPs

Bankers and traders buy and sell one currency for another in international money markets. The price of one currency (pounds) in terms of another (dollars) is called the exchange rate. Exchange rates are determined moment by moment in international currency markets by supply and demand.

[7]For practical reasons, for a few drugs we modified our preferred method of matching. In some cases, we matched drugs whose available package sizes in both countries were equal, although this package size was not the most commonly used in the United States. Nonetheless, we found that this modification had little or no effect on the price differentials for the drugs in question.

Exchange rates are a frequently used, natural method of converting from one currency to another. Because exchange rates are affected by financial market conditions, however, they can fluctuate a good deal. Variations in exchange rates can increase or decrease the dollar price of a U.K. drug compared with a U.S. drug, even when the drug's price in pounds has not changed.

The PPP measure was developed to smooth out fluctuations in exchange rates. The PPP compares overall prices in the two countries. PPPs vary less than exchange rates because they do not depend on financial market conditions; however, the PPP is slower to respond to actual consumer price changes in the home country.

While PPP has the advantage of smoothing out exchange rate fluctuation, drug prices based on PPP are in some sense artificial. While a U.S. drug purchaser could (by exchanging dollars for pounds at the prevailing exchange rate) buy a drug in the United Kingdom at the price on the basis of exchange rates, prices based on PPPs are not actual market transaction prices. Neither the exchange rate nor the PPP has an unambiguous theoretical advantage over the other; that is, neither is more correct to use for our purposes. Therefore, we chose to report both results.

Summarizing Price Differences for Many Different Drugs

The preferred method of summarizing price differences for many drugs is to construct a price index, which shows how the average price of a bundle of goods differs across countries. There are several possible methods for constructing such a price index. Each method involves two major methodological decisions:

- The researcher must choose which country to use as the basis for comparison. That is, the researcher must answer one of two questions: (1) How much more expensive are drugs in country X compared with country Y? or (2) How much cheaper are drugs in country Y compared with country X?
- The researcher must choose how to weight the individual goods in the bundle.

Because our methodological criteria specified that we use the U.S. consumer as the point of reference, the answer to the first question was simple: we would examine how much cheaper or more expensive drugs are in the United States than in the United Kingdom.

Choosing how to weight the goods in the bundle can be more problematic. Ideally, drugs that are more often prescribed would be assigned greater importance. The prices of such popular drugs would have a greater effect on the average consumer than the prices of less common medications; thus popular drugs deserve more emphasis in a price index measure. To assign more weight to the more popular drugs, a measure of each drug's popularity is needed.

We chose to weight drugs based on quantities sold. This weighting scheme achieves the goal of weighting the more popular drugs more heavily in a price index. Three quantity-weighted price indexes are possible: (1) weights based on quantities sold in the United States, (2) weights based on quantities sold in the United Kingdom, and (3) weights based on both U.S. and U.K. quantities. Given our emphasis on the U.S. consumer, we chose to weight drugs based on the quantities sold in the United States.

Specifically, we calculated the cost of the U.S. market basket as follows:

$$\sum_{i=1}^{77} USPRICE_i \; w_i$$

In this formula, $USPRICE_i$ is the U.S. factory price of drug i, and w_i is a volume weight for drug i. (This weight is calculated by dividing the number of units (for example, pills or capsules) of drug i sold in the United States in 1992 by the total number of units of all 77 drugs in our sample sold in the United States in 1992.)

We calculated the cost of the U.K. market basket as follows:

$$\sum_{i=1}^{77} UKPRICE_i \; w_i$$

In this formula, $UKPRICE_i$ is the U.K. factory price of drug i.

Conclusion

A rigorous, appropriate, and feasible methodology is necessary for meaningful international drug price comparisons. However, good price

comparisons require confronting many difficult methodological decisions. We submitted our methodology to U.K. government officials, pharmaceutical industry representatives, and academic researchers and incorporated their comments as appropriate.

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